
Barnhill Quarry, Avon

[ST 724 825]–[ST 726 828]

Introduction

The Barnhill Quarry GCR site is a disused quarry (also referred to as 'Arnold's Quarry'; see Murray and Wright, 1971) lying immediately to the north of Chipping Sodbury in Gloucestershire [ST 7240 8250]–[ST 7260 8280]. It provides an outstanding section of the Clifton Down Limestone (late Arundian–Holkerian). Note that since there is no clear differentiation between the Lower Clifton Down Limestone and the Upper Clifton Down Limestone in this area (Kellaway and Green, 1993; and see (Figure 8.2), Chapter 8) the exposed limestone sequence at this site is simply referred to as the 'Clifton Down Limestone'. The section is the best outcrop illustrating the shallow-water sedimentary rocks and cyclic nature of this time interval in south-west Britain. It also exhibits spectacular sedimentary structures such as ripple-marked sandstones with trace fossils, and provides a rare opportunity to see a variety of stromatolites. These steeply dipping limestones are truncated at the top of the cliff by a planar unconformity capped by late Triassic desert deposits. Murray and Wright (1971) provide a detailed description of the succession but little biostratigraphical information is available for this site.

Description

There are two quarry faces running north to south, providing discontinuous sections through the unit. The succession (see (Figure 9.47)) dips steeply to the west, the eastern side of the site covering a strike section of the lowest part of the Clifton Down Limestone. The west side exposes a section near the top of the formation. The base of the section is a huge bedding plane exposure of wave-rippled sandstone (Figure 9.48) covering an area of several hundred square metres, much of which is accessible with care. Locally the surface also displays abundant *Chondrites* trace fossils (Simpson, 1957), with some of these sediment-filled tubes having been reworked and concentrated into the troughs between ripples. This sandstone occurs approximately 1 m above the top of the Lower Cromhall Sandstone. It is also seen in the active quarry to the north of the site where a complete section of Courceyan–Holkerian age extending from the Black Rock Group to the Clifton Down Limestone and Middle Cromhall Sandstone is exposed (Vanstone, 1991).

Above the Lower Cromhall Sandstone, the lower part of the Clifton Down Limestone comprises approximately 8 m of cyclic bioturbated oolitic limestones alternating with small developments of stromatolitic limestone (Figure 9.49). Five such cycles occur and the stromatolites are typically overlain by rippled surfaces and by finely laminated dark-grey shales. The stromatolites occur as small columnar forms a few centimetres high, as small domes, or as undulating laminae just a few centimetres thick. Some are associated with fenestral fabrics, but not all. This part of the formation is overlain by a thick unit of oolitic, peloidal and bioclastic limestones with two more prominent domal stromatolite horizons but also with large colonial coral masses, some of which give the appearance of having been overturned and abraded. Detailed descriptions of this part of the succession are to be found in Murray and Wright (1971).

The higher parts of the formation (see (Figure 9.47)) are poorly exposed on the western face of the quarry and where access to them is difficult.

The most notable feature of this part of the sequence is the development of a single bed of columnar stromatolites 0.5 m thick exposed on a distinctive bench in the quarry face (Murray and Wright, 1971). Such forms with this growth morphology are rare in post-Precambrian successions.

Interpretation

The Clifton Down Limestone in this area appears to represent a single transgressive-regressive cycle (Figure 9.47). The rippled sandstones at the base of the section represent the marine reworking of the underlying fluvial Lower Cromhall

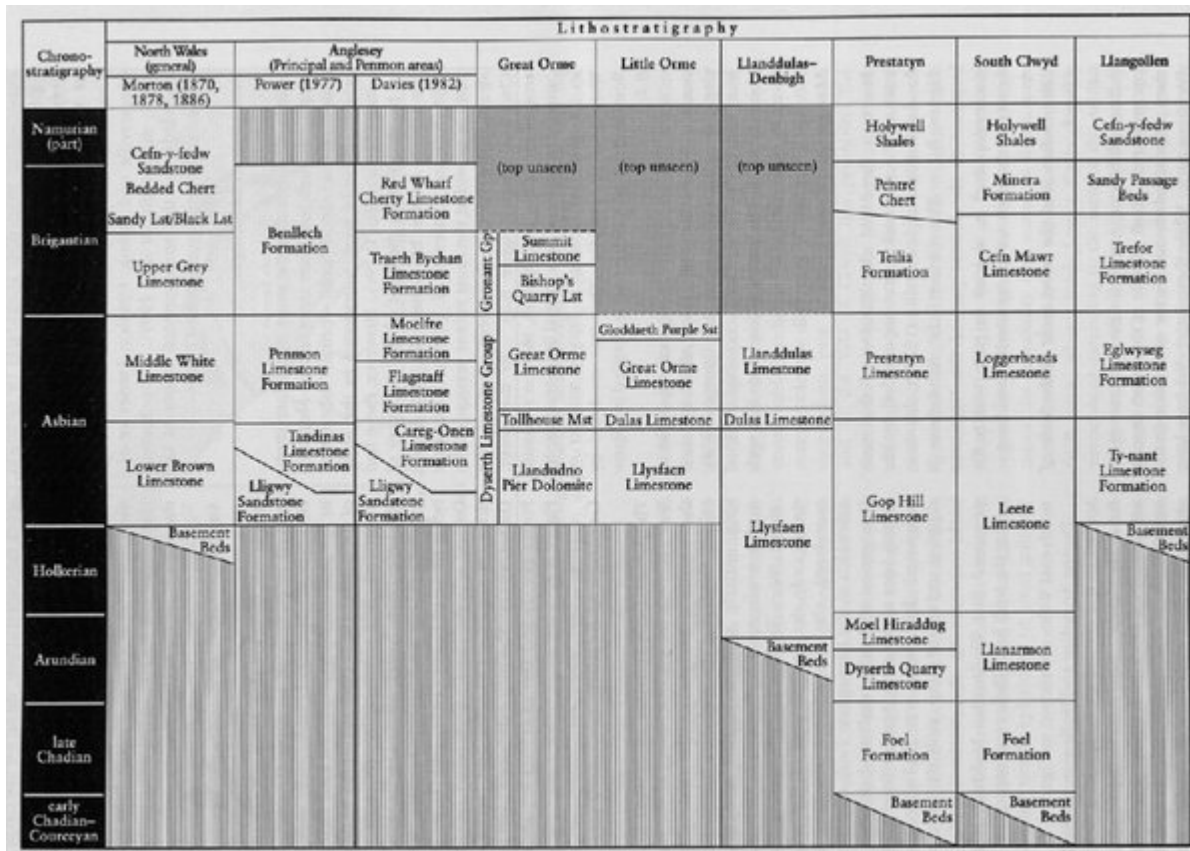
Sandstone during a late Arundian–early Holkerian transgressive event.

The cyclic oolitic–stromatolitic limestones are mainly subtidal in origin and form part of the transgressive sequence. They could be regarded as small parasequences although their exact origin is unclear; they could simply represent stabilized storm sheets adjacent to an oolite shoal. The overlying coral-bearing limestones represent slightly deeper waters but still within wave-base depths. The stromatolitic bed on the west bench developed in restricted subtidal conditions.

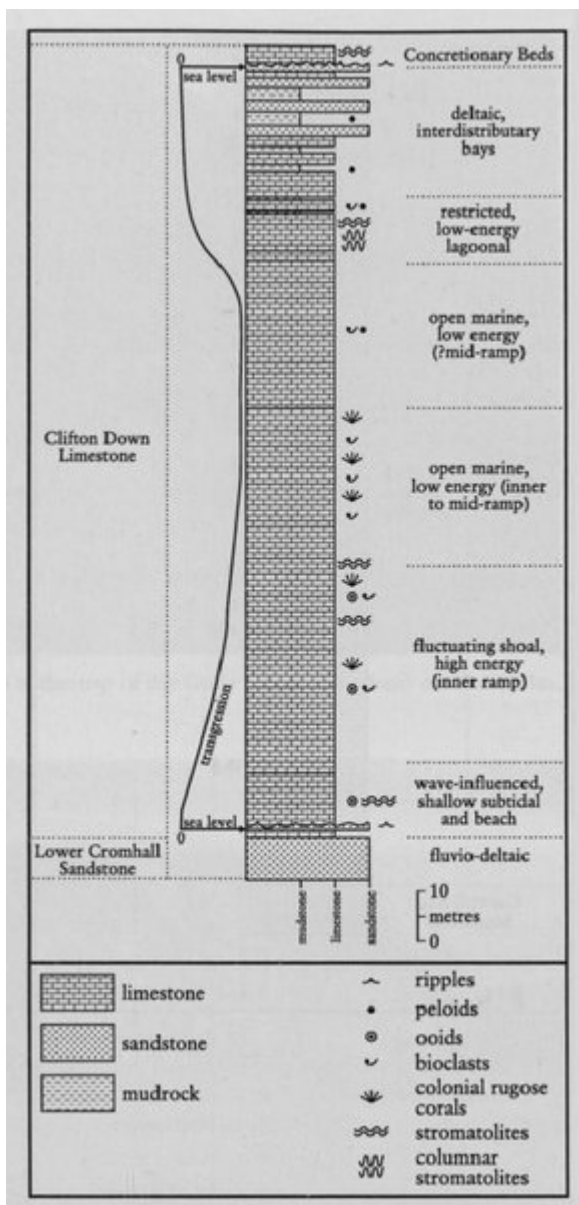
Conclusions

This site preserves incomplete sections in the Clifton Down Limestone, but provides the finest section of shallow marine cyclic sediments in the Holkerian strata of southern England. The site also reveals some beautifully preserved sedimentary structures, including a spectacular ripple-marked bedding plane and a unique assemblage of microbial stromatolites.

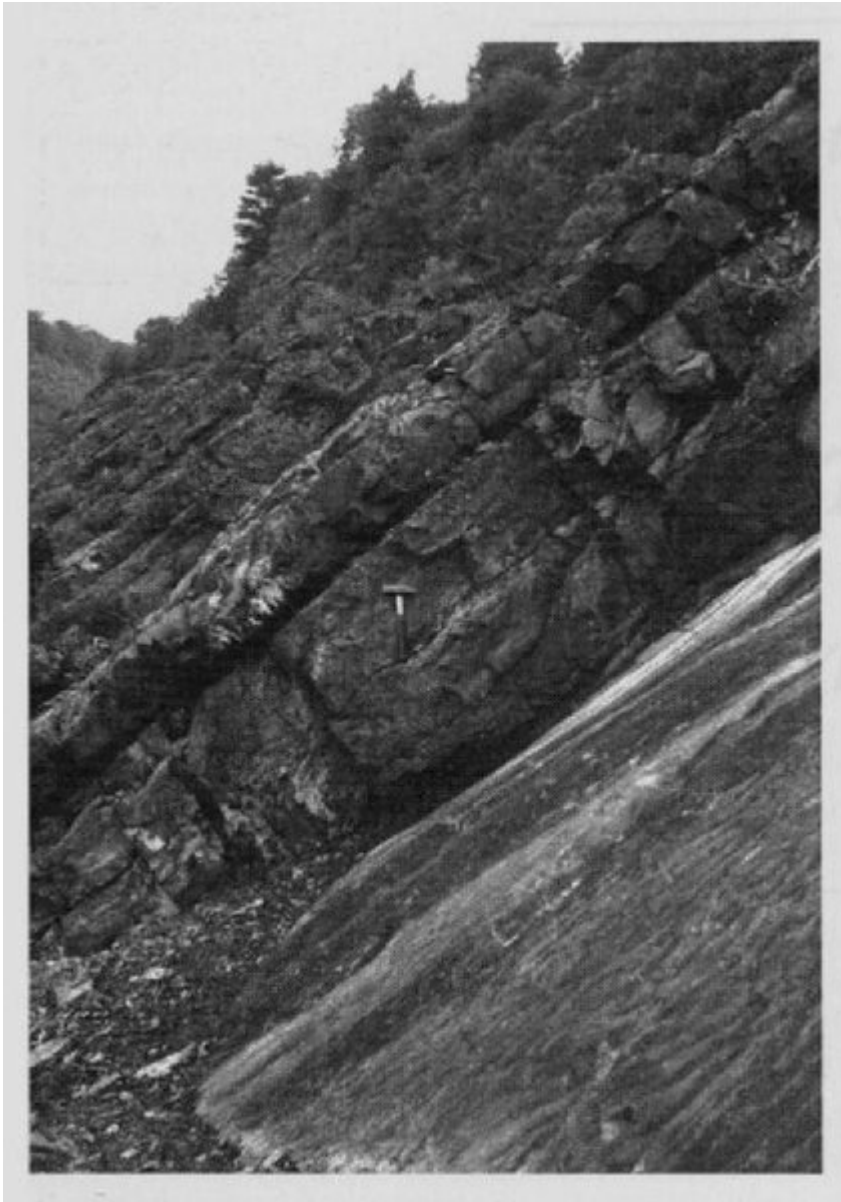
References



(Figure 8.2) Simplified stratigraphical chart for the Lower Carboniferous succession of North Wales. In the central areas of the Great Orme, the Little Orme and Llanddulas to Denbigh, Warren et al. (1984) placed Brigantian strata in the Gronant Group and Asbian strata in the Dyserth Limestone Group. Compilation based on information from Power (1977), Somerville (1979a), Davies (1982), Somerville and Strank (1984c), Warren et al. (1984), Somerville et al. (1986) and Davies et al. (1989). Areas of vertical ruling indicate non-sequences. Not to scale.



(Figure 9.47) Sedimentary log of the Clifton Down Limestone at the Barnhill Quarry GCR site, Chipping Sodbury. The lower half of the succession is well exposed on the eastern side of the site (see (Figure 9.48)). The columnar stromatolites seen towards the top of the succession crop out on a quarry bench on the western side of the site. Note that the Lower Cromhall Sandstone is not exposed at this site. After, in part, information from Murray and Wright (1971).



(Figure 9.48) The lower part of the Clifton Down Limestone at Barnhill Quarry, Chipping Sodbury, showing a prominent sandstone bedding plane surface covered in wave ripples and overlain by shallow marine oolitic–stromatolitic grainstones. (Photo: P.J. Cossey.)



(Figure 9.49) Stromatolitic domes on the top surface of a stromatolite unit near the base of the Clifton Down Limestone at Barnhill Quarry (see text for further details. (Photo: V.P. Wright.)